

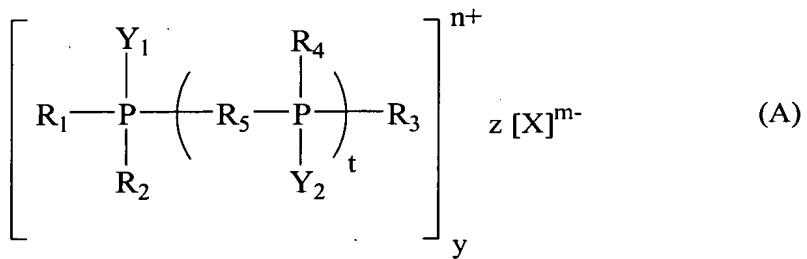
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Serial No. 10/770,474

CLAIM AMENDMENTS

Please amend claims 1, 6, 7, 18, 19, 21, 22, 23, 24, and 25 as set out hereinafter.

1. (currently amended) A method of bleaching and brightness stabilization of a lignocellulosic material comprising bleaching the lignocellulosic material with a water-soluble phosphine or phosphonium compound of formula (A):



wherein t is zero or 1;

when $t = 0$, $R_4R_5PY_2$ is absent and R_3 is bonded to the P of the $R_1R_2PY_1$ group;

when $t = 1$, R_5 is absent, an alkylene group $(CH_2)_s$ ($s = 1$ to 12) interrupted by 0 to 6 oxygen (O) atoms or secondary amino (NR') groups, and/or substituted by a zero to 2s number of a hydroxyl, alkyl, aryl, thio, thioether, amino, ester, amide, carboxyl and/or carboxylate groups, or a phenylene group substituted by a zero to 4 number of a hydroxyl, alkyl, aryl, thio, thioether, amino, ester, amide, carboxyl, carboxylate, and/or sulfonate groups; or preferably R_5 is an alkylene group $(CH_2)_s$ ($s = 1$ to 4) where the carbon chain is optionally interrupted by one or two oxygen (O) atom(s);

m is an integer of 0 to 5 and y is an integer of 1 or more, and n and z are integers of 0 or more such that $yn = zm$;

wherein when $y = 1$, and $n = z = m = 0$, then Y_1, Y_2 and X are absent;

R_1 , R_2 and R_3 , or R_1 , R_2 , R_3 , R_4 and R_5 groups are collectively selected such that the molecule said compound of formula (A) has an overall solubility of at least 0.01 g/L;

R_1 , R_2 and R_3 , or R_1 , R_2 , R_3 and R_4 are independently selected from hydrogen, optionally substituted linear or branched alkyl groups, or optionally substituted aryl groups, the optional substitution being the presence of substituents selected from ether, amino, hydroxy, ester, thioether, amide, carbonyl, carboxyl, and carboxylate moieties;

Y_1 and Y_2 are independently absent or a carboxylate moiety.

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wherein when X is present, X is an inorganic or organic anion, and the value of m is ≤ 5 ; the total charge of $yn = zm$;

Y_1 is a hydroxymethyl group (CH_2OH); R_1 , R_2 and R_3 , or R_1 , R_2 , R_3 , R_4 and Y_2 are independently selected from hydrogen, a ~~Lewis acid such as~~ boron trifluoride (BF_3), optionally substituted linear or branched alkyl groups, or optionally substituted aryl groups, the optional substitution being the presence of substituents selected from ether, amino, hydroxy, ester, thioether, amide, carbonyl, carboxyl, and carboxylate moieties; and stabilizing the brightness in the resulting bleached lignocellulosic material with said compound of formula A.

2. (original) A method according to claim 1 wherein Y_1 and Y_2 are both absent, R_1 , R_2 and R_3 , or R_1 , R_2 , R_3 and R_4 are independently hydrogen, an alkyl group (R) or an ether group (OR) with R being $(CH_2)_qH$ ($q = 1$ to 12) interrupted by 0 to 6 oxygen (O) atoms or secondary amino (NR') groups, and/or substituted by a zero to $(2q + 1)$ number of a hydroxyl, thio, thioether, amino, ester, amide, carboxyl and/or carboxylate groups. R' is either hydrogen or an optionally substituted linear or branched alkyl group or optionally substituted aryl group; whereun optional substitution refers to the presence of one or more substituents selected from ether, amino, hydroxy, ester, thioether, amide, carbonyl, carboxyl, and carboxylate moieties.

3. (original) A method according to claim 1, wherein Y_1 and Y_2 are both absent, R_1 , R_2 and R_3 , or R_1 , R_2 , R_3 and R_4 are independently hydrogen, an alkyl group (R) or an ether group (OR) with R being $CH_2(CH_2)_qH$ ($q = 0$ to 5) interrupted by 0 to 3 oxygen (O) atoms or secondary amino (NR') groups, and/or substituted by a zero to $(2q + 1)$ number of a hydroxyl, thio, thioether, amino, ester, amide, carboxyl and/or carboxylate groups.

4. (original) A method according to claim 1, wherein Y_1 and Y_2 are both absent, at least one of R_1 and R_2 is the same as R_3 in the molecule with R_3 being a hydroxymethyl (CH_2OH) group.

5. (original) A method according to claim 1, wherein Y_1 and Y_2 are both absent, R_1 , R_2 and R_3 , or R_1 , R_2 , R_3 and R_4 are all hydroxymethyl (CH_2OH) groups.

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6. (currently amended) A method according to claim 1, wherein Y₁ is a hydroxymethyl group (CH₂OH), R₁, R₂ and R₃, or R₁, R₂, R₃, R₄ and Y₂ are independently hydrogen, a Lewis acid such as boron trifluoride (BF₃), an alkyl group (R) or an ether group (OR) with R being (CH₂)_qH (q = 1 to 12) interrupted by 0 to 6 oxygen (O) atoms or secondary amino (NR') groups, and/or substituted by a zero to (2q + 1) number of a hydroxyl, thio, thioether, amino, ester, amide, carboxyl and/or carboxylate groups, R' is either hydrogen or an optionally substituted linear or branched alkyl group or optionally substituted aryl group; wherein optional substitution refers to the presence of substituents selected from ether, amino, hydroxy, ester, thioether, amide, carbonyl, carboxyl, and carboxylate moieties.

7. (currently amended) A method according to claim 1, wherein Y₁ is a hydroxymethyl group (CH₂OH), R₁, R₂ and R₃, or R₁, R₂, R₃, R₄ and Y₂ are independently hydrogen, a Lewis acid such as boron trifluoride (BF₃), an alkyl group (R) or an ether group (OR) with R being CH₂(CH₂)_qH (q = 0 to 5) interrupted by 0 to 3 oxygen (O) atoms or secondary amino (NR') groups, and/or substituted by a zero to (2q + 1) number of a hydroxyl, thio, thioether, amino, ester, amide, carboxyl and/or carboxylate groups.

8. (original) A method according to claim 1, wherein X is selected from chloride, sulfate, hydroxide, hydrosulfite, phosphate, carbonate, bicarbonate, bisulfate, alkoxide, formate, acetate, citrate, oxalate, ascorbate, ethylenediaminetetraacetate or diethylenetriaminepentaacetate.

9. (previously presented) A method according to claim 1, wherein Y₁ is a hydroxymethyl group (CH₂OH), and at least one of R₃, R₄ and Y₂ is a hydroxymethyl (CH₂OH) group.

10. (original) A method according to claim 1 wherein said compound is the phosphine tris(hydroxymethyl)phosphine (THP), P(CH₂OH)₃.

11. (original) A method according to claim 1 wherein said compound is the phosphine tris(hydroxypropyl)phosphine (THPP), P(CH₂CH₂CH₂OH)₃.

12. (original) A method according to claim 1 wherein said compound is the phosphine bis[bis(hydroxymethyl)phosphino]ethane, (HOCH₂)₂PCH₂CH₂P(CH₂OH)₂.

13. (original) A method according to claim 1 wherein said compound is the phosphonium compound tetrakis(hydroxymethyl)phosphonium chloride (THPC), $[\text{P}(\text{CH}_2\text{OH})_4]\text{Cl}$.

14. (original) A method according to claim 1 wherein said compound is the phosphonium compound tetrakis(hydroxymethyl)phosphonium sulfate (THPS), $[\text{P}(\text{CH}_2\text{OH})_4]_2\text{SO}_4$.

15. (original) A method according to claim 1 wherein said compound is the phosphonium compound 3-[tris(hydroxymethyl)phosphonium]propionate, $(\text{CH}_2\text{OH})_3\text{P}^+-\text{CH}_2\text{CH}_2\text{COO}^-$.

16. (original) A method according to claim 1 wherein said lignocellulosic material is a mechanical wood pulp.

17. (original) A method according to claim 16 wherein said lignocellulosic mechanical wood pulp is spuce TMP or aspen CTMP.

18. (currently amended) A method according to claim 1 wherein the said lignocellulosic material is a mechanical wood pulp that has been partially or fully bleached with ~~other bleaching chemicals such as~~ alkaline hydrogen peroxide and/or sodium dithionite.

19. (currently amended) A method according to claim 1 wherein the said lignocellulosic material is a chemical wood pulp ~~such as unbleached kraft pulp or kraft pulp~~ partially or fully delignified and/or bleached with ~~delignifying and/or bleaching chemicals such as~~ oxygen and/or chlorine dioxide.

20. (original) A method according to claim 1 wherein the said lignocellulosic material is a paper sheet containing mechanical wood pulp as the sole pulp component or as one of the pulp components.

21. (currently amended) A method according to claim 1 wherein the ~~treatment is bleaching and brightness stabilization are~~ conducted in an aqueous medium at a pH of 2.0 – 12.0, a temperature of 20 – 170 °C and a consistency of 0.01 – 99% for 5 minutes to 30 days with a charge of the phosphorus compound being 0.01 to 6.0%, by weight, based on the oven-dry

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(OD) weight of the lignocellulosic material.

22. (currently amended) A method according to claim 1 wherein the treatment is bleaching and brightness stabilization are conducted at a temperature of 20 – 170 °C and a consistency of 40 – 99% for 5 minutes to 30 days with a charge of the phosphorus compound being 0.01 to 6.0%, by weight, based on the oven-dry (OD) weight of the lignocellulosic materials material.

23. (currently amended) A method according to claim 1 wherein the treatment is bleaching and brightness stabilization are carried out in a single-stage or multi-stage in one or more than one bleach tower, pulp mixer, a storage vessel, an agitated tank or any other stock preparation vessels of a paper machine, or any other vessels suitable for performing the treatment bleaching and brightness stabilization of the pulp lignocellulosic material.

24. (currently amended) A method according to claim 1, wherein the material is also treated with: (a) an organic or inorganic yellowing inhibitor such as a benzotriazole, benzophenone or titanium dioxide ultraviolet absorber (UVA), or a hindered hydroxyamine radical scavenger (RS), (b) a polymeric yellowing inhibitor such as poly(ethylene glycol) or poly(vinyl pyrrolidone) yellowing inhibitor, and/or (c) a metal chelating agent such as diethylenetriaminopentaacetic acid (DTPA).

25. (currently amended) A method according to claim 1, wherein said treating bleaching and brightness stabilizing comprises contacting said material with said water-soluble compound in an aqueous vehicle.

26. (cancelled)

27. (cancelled)

28. (cancelled)

29. (cancelled)

30. (cancelled)

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31. (cancelled)

32. (cancelled)

33. (cancelled)

34. (previously presented) A process according to claim 1, wherein the lignocellulosic material is additionally bleached with sodium dithionite.